OU1 ROUTINE GROUNDWATER MONITORING PLAN
Revision 1

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SHIELDALLOY METALLURGICAL CORPORATION SUPERFUND SITE
Newfield, New Jersey

CERCLA Docket No. 02-2010-2017

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1.0 INTRODUCTION

TRC Engineers, Inc. (TRC), has prepared this Revision (Revision 1) of the Operable Unit 1 (OU1) Routine Groundwater Monitoring Plan for the Shieldalloy Metallurgical Corporation (SMC) Superfund site (Site). The SMC Facility is located at 35 South West Boulevard, Newfield, New Jersey (Figure 1). TRC and SMC executed the Administrative Order on Consent (AOC) for the Site with the U.S. Environmental Protection Agency (USEPA) on April 28, 2010. The AOC defined the following OUs:

- OU1-Non-Perchlorate Groundwater;
- OU2-Non-Perchlorate Soil, Sediment, and Surface Water; and
- OU3-Perchlorate, all media.

TRC prepared the July 2011 OU1 Routine Groundwater Monitoring Plan in satisfaction of Task I, Section F.2 of the AOC and Section II Task 1 of the AOC's Scope of Work. USEPA approved the plan verbally in October 2011, and in writing June 2012. OU2 and OU3 requirements are addressed in other documents. The purpose of the OU1 Routine Groundwater Monitoring Plan was to provide a detailed description of the sampling, analysis and monitoring to be performed during the pre-design investigation (PDI) phase, consistent with the AOC.

TRC has been implementing the OU1 Routine Groundwater Monitoring Plan since 2011. Because of significant project advancements since 2011, it is appropriate to update the plan. More specifically, since the 2011 plan was developed, an ambitious and successful In-Situ Remediation Pilot Program (including appropriate consideration of Monitored Natural Attenuation [MNA]) has been implemented, including supplemental sampling associated with the program. Further, the Pump and Treat system, which had been active since 1979 has been deactivated with approval from EPA and the New Jersey Department of Environmental Protection (NJDEP). Also, from a regulatory perspective, the USEPA is in the process of developing a Record of Decision (ROD) Modification, to update the Site's oversight documents. This regulatory transition and the project advances makes this an appropriate and prudent time to update the OU1 Monitoring Plan.

This OU1 Routine Groundwater Monitoring Plan Revision 1 (OU1 Monitoring Plan, Rev. 1) builds upon the approved plan, and incorporates adjustments to sampling techniques (e.g. low flow sampling) to accommodate the current status of the aquifer, includes additional parameters to verify attenuation of constituents of interest, and adjusts the monitoring well network to better target the acquisition of quality data for long term monitoring purposes.

The OU1 Monitoring Plan Rev. 1 has been prepared in accordance with USEPA Region 2 Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Projects (dated April 2004a), the Uniform Federal Policy for Quality Assurance Project Plans, (dated March 2005)**,** and the most recent guidance in N.J.A.C. 7:26E Technical Requirements for Site Remediation and the NJDEP Field Sampling Procedures Manual (2005), where appropriate. This OU1 Monitoring Plan Rev. 1 is organized as follows:

- Section 1 presents introductory, background information and physical setting;
- Section 2 discusses the sample collection and handling procedures; and
- Section 3 provides the reporting and schedule requirements.

The OU1 Monitoring Plan Rev. 1 includes the OU1 Quality Assurance/Quality Control Project Plan Revision 1 (QAPP Rev. 1), which is provided as Appendix A (as a separate volume). The USEPA-approved 2011 OU1/OU2 Health and Safety Plan (HASP) is a companion document to this OU1 Monitoring Plan Rev. 1.

This OU1 Monitoring Plan Rev. 1 contains the procedures and protocols for sampling and analysis of groundwater monitoring wells.

OU1 has been studied and remediated for over 30 years, so an enormous amount of data exists for the Site. The OU1 Monitoring Plan Rev. 1 will target future data acquisition appropriate to the nature and status of the project at this time.

In order to provide quality and appropriate data, it may be appropriate, from time to time, to make adjustments to the OU1 Monitoring Plan, as site conditions evolve, if regulations are updated, or if sampling or remedial technologies are updated/adapted. Accordingly, TRC may make appropriate changes to the OU1 Monitoring Plan, in the future, to keep pace with advancing needs and conditions of the project. TRC will update the USEPA with future revisions either through the development and submission of additional revisions to the plan, or, if the changes are smaller, through letter-amendments to the plan.

Background information about the Site are discussed in the following sections.

1.1 Site Location

The Facility is located at 35 South West Boulevard, primarily in the Borough of Newfield, Gloucester County, New Jersey. A small portion of the southwest corner of the Site is located in the City of Vineland, Cumberland County, New Jersey. A Site location map is provided on Figure 1. The SMC Facility comprises approximately 67.7 acres. The approximate center of the Facility is located at latitude 39°32’27.6”N, longitude 75°01’06.7”W. SMC also owns an additional 19.8 acres of farmland, referred to as the “Farm Parcel”, located in Vineland, approximately 2,000 feet southwest of the Facility. SMC purchased the Farm Parcel to facilitate the groundwater remediation. This Farm Parcel has never been used for manufacturing or related activities.

Specialty glass manufacturing began at the Site in the early 1900s. SMC manufactured specialty metals at the Site from 1955 to approximately 2006. The Site is currently used as office space and is sublet as warehousing and construction equipment storage space.

The Site is bordered as follows:

- To the north by a former rail spur and a former landfill;
- To the west by Conrail rail lines, South West Boulevard, and various light industries and residences;
- To the east by a wooded area, residences and small businesses; and
- To the south by Hudson Branch stream, its associated wetlands/headwaters, and residences (located along Weymouth Road).

The Site is secured by a perimeter chain link fence. The Facility parking lot along the western property boundary lies outside of the chain link fence to allow visitor and administrative access. A detailed plan depicting the boundaries and physical features of the Facility and Farm Parcel (the Site) is provided as Figure 2.

1.2 Site History

Specialty glass manufacturing began at the Site in 1924. SMC purchased the Site in the early 1950s and, from 1955 to approximately 2006, SMC manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals and optical surfacing products at the Site. The Site is currently used as office space and sublet as warehousing/storage space.

Manufacturing wastewater generated at the Site was historically treated on the central portion of the Facility, and was characterized by the presence of several wastewater treatment lagoons. An unlined lagoon originally held untreated process wastewater during the 1960s but was subsequently replaced with nine smaller lined lagoons in which wastewater was treated prior to discharge. Over time the wastewater treatment process was modified, and the use of the lagoons was gradually phased out. The lagoons were closed and remediated under NJDEP oversight in the 1990s.

A ROD for the groundwater operable unit was signed on September 24, 1996 that required that a pump and treat system be used to help address OU1. Pumping and treating had started in 1979. SMC/TRC operated the groundwater pump and treat system to contain and treat chromium and trichloroethylene (TCE). Five extraction wells, which consist of two at the southwest corner of the Facility (W9 and Layne), two "Car Wash" wells (RW6S and RW6D), and one well on the Farm Parcel (RIW2), withdrew groundwater at varying times/flowrates.

TRC prepared an OU1 Optimization Study in 2010 as required by the 2010 AOC, which found that the pump and treat system had reached asymptotic levels (since approximately 2000) and that a revised site approach, including in-situ remediation and revised ex-situ treatment technologies, could expedite aquifer cleanup and provide more sustainable site operation. USEPA approved the Optimization Study in 2011. The ex-situ treatment technology was converted from electrochemical precipitation to ion exchange in 2011. The pump and treat system was deactivated in March 2011 to accommodate a revised approach to OU1, per USEPA's March 2013 work plan approval. NJDEP's Water Allocation Bureau, at specific request by TRC and with support of the USEPA, closed the Water Allocation Permit in May 2014. In May 2014, at specific request by TRC and support of the USEPA, NJDEP's Water Compliance and Enforcement group, suspended permit sampling requirements until June 2014, at which time the NJPDES Permit was allowed to expire.

USEPA approved the 2011 OU1 Pre-Design Supplemental Investigation Report in 2014, which completed OU1 delineation, and found that non-SMC sources released Perchloroethylene (PCE), TCE, and daughter breakdown products downgradient of the Facility.

During 2010, 2011, 2012, 2013 and 2014, TRC, implemented an ambitious and successful OU1 In-Situ Remediation Pilot Program with the approval of USEPA and NJDEP. In general, the program included targeted and phased injection of Calcium Polysulfide (CPS) to remediate OU1 chromium, and targeted emulsified vegetable oil (EVO) to remediate Site TCE. The March 2014 OU1 In-Situ Remediation Pilot Program Evaluation Report (OU1 Evaluation Report) concluded that the pilot program was successful in reducing contamination, that active remediation was ongoing (i.e., the injected materials continue to reduce contamination), and that MNA was effective and viable to address residual contamination when CPS reactivity diminishes (i.e., after 5 to 10 years in the upper zone of the aquifer and after 20 to 35 years in the lower zone of the aquifer). The June 2014 OU1 Focused Feasibility Study (OU1 FFS; TRC, 2014a), approved by the USEPA August 2014, evaluated pump and treat versus in-situ remediation and determined that in-situ remediation ranked better against USEPA's nine evaluation criteria than pump and treat.

At the time of the submission of this OU1 Monitoring Plan Rev. 1, the USEPA is developing a ROD modification.

1.3 Physical Setting

The Site is located within the Newfield, New Jersey 7.5' United States Geological Survey (USGS) Quadrangle (Figure 1).

1.3.1 Site Drainage and Surface Water

The topography of the Site is relatively flat. The Site is located on a slight topographic high, with the ground surface sloping to the west-southwest, toward the Hudson Branch stream.

Within the SMC Facility, drainage from developed portions is managed via a storm drain system and through overland flow. Most of the drainage from the developed portion of the Facility is directed to the on-site impoundment located in the southwestern portion of the Facility. The drainage from the employee parking lot area (west portion of the Site) is discharged into a ditch near the western boundary of the Site. Storm water drainage in the eastern undeveloped area of the Site is generally via sheet flow.

The most notable surface water body proximate to the Site is the Hudson Branch. The Hudson Branch originates just to the east of the Site and runs generally along the Facility's southern border. Based on numerous site inspections, the Hudson Branch (along the southeast portion of the Facility) is relatively dry during most periods of the year. The upstream drainage area of the Hudson Branch is estimated at 1,180 acres (TRC, 2006). Runoff enters the Hudson Branch via overland flow and a number of culverts, including a north-south 36-inch diameter culvert that bisects the Site and conveys storm water from areas of Newfield north of the Site to the Hudson Branch. A broader area, approximately 1.4 acres in size, is located within this reach of the Hudson Branch, immediately south of SMC's former thermal cooling pond. The channel of the Hudson Branch along the southern boundary of the Site varies in size; its width ranges from as little as a few feet at many locations to 100 feet wide at the broader area. The water depth in this portion of Hudson Branch ranges from zero feet (during dry periods) to approximately 3 feet deep.

Downstream of the SMC Facility, the Hudson Branch flows southwesterly, under South West Blvd. and Weymouth Road (via culverts) then through the Farm Parcel, discharging into Burnt Mill Pond, located approximately 6,500 feet southwest of the SMC Facility (see Figure 1). Burnt Mill Pond has a surface area of approximately 15 acres in size and is impounded by a dam. Burnt Mill Pond is reported to be shallow, with a mean depth of 2.4 feet.

As shown of Figure 1, Burnt Mill Branch (sometimes referred to as the Manaway Branch) generally runs north to south and discharges into Burnt Mill Pond. Burnt Mill Branch is located approximately 4,000 feet west of the Site. The headwaters of Burnt Mill Branch begin approximately 7,000 feet north of the Site. The Burnt Mill Branch continues from Burnt Mill Pond, joining the Maurice River approximately 9,000 feet southwest of Burnt Mill Pond.

1.3.2 Surficial Geology

Three surficial geologic units underlie the Site, which include the Bridgeton Formation, Cohansey Sand Formation, and the Kirkwood Formation. Near the Facility, the Bridgeton and Cohansey Formations combined consist of approximately 125 feet of sandy deposits that generally includes the following stratigraphy from the ground surface, downward:

- Approximately 20 feet of medium to coarse sand with minor amounts of gravel, underlain by approximately 40 feet of fine to medium sand and approximately 15 feet of coarser sand with gravel, totaling approximately 75 feet. These soils are referred to as the upper zone of the aquifer.
- Soils underlying the upper zone are comprised of approximately 40 feet of sand with an appreciable amount of clay that transitions to approximately 10 feet of predominantly medium sand. These soils are referred to herein as the lower zone of the aquifer and are underlain by the Kirkwood Formation
- The Kirkwood Formation, predominantly a vertically confining gray clay and silt layer, was encountered between 121 to 153 feet below grade, underlies the Cohansey Sand Formation.

The thickness of the unsaturated soils at the Site ranges from a few feet (near the Hudson Branch) to 17 feet (in the northwest part of the Site).

1.3.3 Bedrock Geology

Based on the average degree of dip for overburden in the Newfield area, it is estimated that the depth to bedrock beneath the Site is approximately 2,000 feet below grade. Bedrock has not been encountered at the Site during previous investigations. Bedrock beneath the Site consists of banded, micaceous schists or gneiss within the Wissahickon Formation of Precambrian age. The Wissahickon Formation contains mica, quartz, feldspar, and chlorite with numerous fractures, joints, and folding of individual layers. The formation outcrops northwest of Gloucester County.

1.3.4 Local Hydrogeology

The principal aquifer in the vicinity of the Site is the Cohansey Sand, which is approximately 125 feet thick. The Cohansey Sand is underlain by the Kirkwood Formation. The upper portion of the Kirkwood Formation is composed of silt and clay, which functions as a confining unit in the vicinity of the Site, restricting the downward flow of groundwater from the Cohansey Sand. Depths to groundwater across the Site range from surface grade at the Hudson Branch to 17 feet below ground in the northwest quadrant of the Site. Based on extensive investigations in the vicinity of the Site, groundwater was identified at depths ranging from 4 feet to 31 feet. Seasonal fluctuations in the water table elevations are on the order of a few feet. Groundwater flow direction in the Cohansey Sand is southwest, which closely matches general Site topography. The average linear on-site groundwater flow velocity in the upper zone of the aquifer is about 2.9 ft/day and approximately 0.6 feet per day in the lower zone. A minimal downward hydraulic gradient has been observed in most on-site well clusters indicating that flow in the Cohansey Sand is primarily in a horizontal direction.

Anthropogenic factors including sewer systems and other buried utilities may also affect local groundwater movement in the shallow portion of the aquifer.

An extensive network of groundwater monitoring wells (approximately 200 wells) is located on the subject Site, on adjacent properties and roadside right-of-ways (ROWs).

1.4 Summary of OU1 Contamination

Extensive remediation and investigations for OU1 have been performed for over 30 years, which have generated a robust body of data. The RI identifies chromium as the primary constituent of concern and TCE as the secondary constituent of concern. The nature and extent of these parameters, based on the 2014 FFS, are discussed in the subsections below. Also, for completeness, the status of other metals and other volatile organic compounds (VOCs) identified in OU1 are discussed.

1.4.1 Chromium in Groundwater

Chromium has been detected in OU1 groundwater extending from the Facility, past the Car Wash, to the Farm Parcel in both hexavalent (Cr(VI)) and trivalent (Cr(III)) forms. The chromium plume is ½ mile long and 100-300 feet wide, on average. The chromium plume was generally broader at the Facility (because of the former sources), and narrower at the Farm Parcel (generally consistent with the fate and transport nature in a sandy aquifer).

NJDEP and USEPA cleanup standards for chromium (70 µg/L and 100 µg/L, respectively) are based on total chromium. During the initial investigations and the risk characterization (1995), chromium concentrations were as high as 88,000 µg/L chromium and 1,400,000 µg/L hexavalent chromium. The OU1 Optimization Study indicates that chromium concentrations from the pumping wells have been asymptotic at approximately 1,000 µg/L for over 10 years. The asymptotic conditions appear to be sustained by defined zones containing higher residual chromium concentrations. Prior to In-Situ Remediation (ISR) activities (2010), chromium concentrations ranged between Not-Detected (ND) and 30,000 µg/L at the Facility and between ND and 18,000 µg/L at the Farm Parcel. ISR injections have overcome the asymptotic nature of the pump and treat, and have substantially reduced concentrations of total and hexavalent chromium throughout most of the plume. Current total chromium isopleths for both the upper and lower aquifer zones are included as Figures 3 and 4, respectively. As of April 2014, more than 70 percent of the wells in the lower zone and nearly 80 percent of the wells screened in the lower zone had attained concentration that can be fully addressed through MNA. Further reductions supporting MNA is expected in the remaining wells based on July 2014 CPS injections.

OU2 reporting summarizes that the lagoons (the historic source of OU1 chromium contamination) were properly closed, which included excavation and off-site disposal of soil and extensive post-excavation soil sampling. The OU2 reporting concluded that unsaturated soils do not serve as a source to OU1 chromium contamination.

1.4.2 Other Metals

The OU2 Remedial Investigation (RI) studied certain metals that may or may not exist in Facility soil that have the potential to have an impact to groundwater (IGW), based on a comparison to screening numbers. The OU2 RI concluded that beryllium, nickel and manganese in Facility soils may be affecting groundwater locally (under the Facility). However, Site data indicates that beryllium and nickel are attenuated in groundwater under the Facility, and that manganese attenuates in groundwater (prior to reaching the Farm Parcel). Aluminum may also be impacting groundwater locally. Aluminum is detected in upgradient groundwater at a concentration of approximately 1,000 µg/L, which is above the 200 µg/L groundwater *secondary* Maximum Contaminant Level (MCL), which is based on the aesthetics of water color. It is noted that the USEPA uses a tap water health-based screening criterion of 1,600 µg/L (significantly higher than the 200 µg/L secondary MCL). Site data indicates that aluminum attenuates to the health-based standard before reaching the Farm Parcel. Antimony may also be impacting groundwater locally.

The metal vanadium does not have an NJDEP IGW value; however, the potential for vanadium to migrate through soil and into groundwater was also evaluated, due to the presence of vanadium in site soils and elevated concentrations of vanadium historically detected in groundwater in localized areas beneath the facility. However, shallow groundwater immediately downgradient of the Facility showed that vanadium was either not detected or was present at concentrations that are below the USEPA tap water screening levels for vanadium compounds. This indicates that vanadium attenuates to health-based levels in groundwater.

Manganese, antimony, aluminum, beryllium, nickel and vanadium have been incorporated into the OU1 monitoring program to further validate that these compounds naturally attenuate in groundwater and achieve target concentrations at compliance points.

1.4.3 TCE

TRC's January 2011 Pre-Design Investigation Report, approved by USEPA in February 2014, studied TCE in detail, both on the Facility and off-site. That report concluded that only a small "source" area of groundwater existed at a location where solvents were used in the north/central part of the Facility. It is noted that the OU2 RI Report concluded that there were no detections of VOCs in Facility Soil (including the solvent use area) and that the only "source" was in groundwater. In-situ injections of EVO, plus focused additives, were injected in a matrix into groundwater at the Facility location in 2011. It is concluded that the Facility TCE source has been remediated and that no further active remediation is warranted.

Residual dissolved TCE concentrations were detected in wells at the southwest corner of the Facility in 2014 at concentrations (4-16 µg/L) consistent with 2011/2012 results. It is concluded that the residual TCE concentrations in this area are stable or decreasing based on data presented in the 2013 Annual Groundwater Monitoring and MNA Report (TRC, 2014b).

The OU1 Pre-Design Investigation Report concluded that off-site TCE concentrations namely, those downgradient of the Farm Parcel have been properly delineated and that other sources of chlorinated volatile organic compounds (CVOCs) exist at one or more non-SMC sources, specifically immediately downgradient of the SMC Facility. Four out of five of these CVOC sources have documented PCE releases. It is noted that SMC never used PCE and that PCE was never detected at the Facility. Therefore, PCE detections are indicative of non-SMC sources. NJDEP's Groundwater Quality Standard (GWQS) for PCE is 1 µg/L. It is noted that TCE is a breakdown product of PCE. It is also noted that SMC/TRC is not responsible for cleaning up, or further studying, contamination (including breakdown products) from other sources.

The TCE isopleths for the upper and lower zones based upon current analytical data are shown in Figures 5 and 6, respectively.

1.4.4 Other VOCs

The 2011 Pre Design Investigation report noted PCE concentrations throughout the footprint of the TCE plume downgradient of the off-site sources, ranging from non-detect to 38 µg/L.

OU1 program monitoring will include these other VOCs to provide ongoing data relative to the non-SMC sources for a period of time. Once data shows stable, post-injection data, or if the other PRPs begin appropriate monitoring/remediation, whichever is first, a reasonable adjustment would include removing CVOCs from the parameter list for well locations downgradient of the SMC Facility.

1.5 Objectives

The objectives of the OU1 Monitoring Plan Rev. 1 are to collect quality data that:

- Quantifies concentrations of chromium and TCE over time, allowing evaluation of project objectives as established in the ROD Modification;
- Monitors geochemical parameters, allowing the measurement of the degree of active remediation and/or MNA, over time; and
- Documents that certain metals associated with OU2 soils (i.e., aluminum, antimony, beryllium, manganese, nickel, and vanadium) are not adversely impacting groundwater quality.

The data acquisition procedures designed to meet these objectives are discussed in Section 2.0.

1.6 Identification of ARARs and TBC Information

This section provides a summary of the regulations that are considered Applicable, Relevant, and Appropriate Requirements (ARARs) to remediation of OU1, based on the discussions in the OU1 FFS. Both Federal and State environmental and public health requirements are considered.

1.6.1 Definition of ARARs

The statutory requirements that are directly relevant to the remediation of the SMC Site are identified and discussed using the framework and terminology of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA). These Acts specify that Superfund remedial actions must comply with the requirements and standards of both federal and state environmental laws.

The USEPA defines applicable requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site." An applicable requirement must directly and fully address the situation at the Site.

The USEPA defines relevant and appropriate requirements as "those cleanup standards, standards of control, or other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA Site, address problems or situations sufficiently similar to those encountered at the CERCLA Site that their use is well suited to the particular Site."

Actions must comply with state ARARs that are more stringent than federal ARARs. State ARARs are also used in the absence of a federal ARAR, or where a state ARAR is broader in scope than the federal ARAR.

ARARs are not currently available for every chemical, location, or action that may be encountered. When ARARs are not available, remediation goals may be based upon other federal or state criteria, advisories and guidance, or local ordinances. In the development of remedial action alternatives, the information derived from these sources is termed "To Be Considered," or TBCs.

Remedial actions performed under Superfund authority must comply with ARARs except in the following circumstances: (1) the remedial action is an interim measure or a portion of the total remedy that will attain the standard upon completion; (2) compliance with the requirement could result in greater risk to human health and the environment than alternative options; (3) compliance is technically impractical from an engineering perspective; (4) the remedial action will attain an equivalent standard of performance; (5) the requirement has been promulgated by the State, but has not been consistently applied in similar circumstances; or (6) the remedial action would disrupt fund balancing.

ARARs and TBCs are classified as chemical-, action-, or location-specific. Chemical-specific ARARs or TBCs are usually health- or risk-based concentrations in environmental media (e.g., air, soil, water), or methodologies that when applied to site-specific conditions, result in the establishment concentrations of a chemical that may be found in, or discharged to, the ambient environment. Location-specific ARARs or TBCs generally are restrictions imposed when remedial activities are performed in an environmentally sensitive area or special location. Some examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs or TBCs are restrictions placed on particular treatment or disposal technologies. Examples of action-specific ARARs are effluent discharge limits and hazardous waste manifest requirements.

As specified in the 1988 Guidance (USEPA, 1988), the preliminary identification of ARARs and TBC can assist in planning RI activities and performing certain data screening. The Baseline Ecological Risk Assessment (BERA) and the Baseline Human Health Risk Assessment (BHHRA) each has rigorous USEPA policies and procedures which must be followed, including initial screening and more detailed analysis of RI data.

1.6.2 Potential ARARs

1.6.2.1 Federal Contaminant-Specific ARARs/TBCs

Chemical-specific ARARs can define acceptable exposure levels and be used in establishing preliminary cleanup goals. Chemical-specific ARARs/TBCs, which may be applicable to the development of cleanup goals for OU1 media at the Site, are addressed below.

MCLs published under the Safe Drinking Water Act (40 CFR 141.11-16 and 141.60-63) may be relevant and appropriate to groundwater remediation. For example, the MCL for total chromium is 100 ppb. There is no separate MCL for hexavalent chromium. It is noted that to ensure that the greatest potential risk is addressed, USEPA's regulation assumes that a measurement of total chromium is 100 percent hexavalent chromium, the more toxic form. The MCL for TCE is 5 µg/L.

Maximum Contaminant Level Goals (MCLGs), also published under the Safe Drinking Water Act (40 CFR 141.50-52) represent non-enforceable health goals for public water supply systems. Under the NCP, non-zero MCLGs are to be used as remedial goals for current or potential sources of drinking water. While groundwater is not a current source of drinking water at the SMC Site, MCLGs, may be relevant and appropriate to groundwater remediation. The MCLG for total chromium is also 100 µg/L.

The USEPA published the Regional Risk Levels (RSLs) tables to provide generic concentrations in the absence of site-specific exposure assessments. Because site-specific risk was considered, the RSLs are not ARARs for this Site.

1.6.2.2 Potential State (New Jersey) Chemical-Specific ARARs/TBCs

Potential chemical-specific ARARs for groundwater in New Jersey includes the New Jersey GWQS (NJAC 7:9C). Groundwater at the Site is classified as Class II. The GWQS for total chromium is 70 µg/L and the GWQS for TCE is 1 µg/L.

1.6.3 Development of Remediation Goals

Based on the ARARs discussed in Section 1.6.2, and consistent with the AOC, the most stringent ARARs appropriate to Site contaminants would apply. In the case of chromium and TCE, the NJGWQS are the most stringent and will apply. So, the Site groundwater cleanup goals for constituents emanating from the SMC site are 70 µg/L for chromium and 1 µg/L for TCE.

Potential Federal and State chemical-specific ARARs and TBC criteria are presented in Table 1.

Additionally, the In-situ and MNA program has established target groundwater concentrations, appropriate to Site location and upper/lower aquifer zones. These target concentrations represent levels at (or below) which MNA is viable[1]. While these MNA targets are not ARARs, they are project goals.

[1] At the Farm Parcel, the upper zone average allowable residual concentration is 750 µg/L total chromium, and the localized high residual threshold concentration is 1,000 µg/L total chromium. The lower zone average allowable residual concentration is 1,250 µg/L total chromium, and the localized high residual threshold concentration is 2,700 µg/L total chromium.

2.0 SAMPLE COLLECTION AND HANDLING PLAN

2.1 Groundwater Monitoring Plan Overview, Locations and Frequency

Routine groundwater sampling will be performed using targeted Site monitoring wells. As recommended by USEPA, when conducted, sampling will target the months of April and October. Monitoring wells that will be included in the routine groundwater monitoring program are depicted on Figures 7 and 8, for the upper and lower aquifer zones, respectively. The well construction details are provided in Table 2.

Specific analyses to be performed at each monitoring location are presented on Table 3. Generally, wells will be sampled for field indicator parameters (i.e., pH, specific conductance, temperature, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity) and the constituents of concern, namely, total chromium, hexavalent chromium and/or TCE, depending on the well. Certain monitoring wells screened in the upper zone will be sampled for additional metals (i.e., aluminum, antimony, beryllium, manganese, nickel and vanadium) to support the conclusions of OU2 work, namely, that concentrations of these metals in Facility soils are not adversely impacting off-site groundwater. The wells analyzed for the selected metals are generally located in and downgradient of areas where soils contained higher concentrations of these metals as identified in a technical memorandum submitted to USEPA entitled OU2 Impact to Groundwater Assessment dated July 2013.

Table 3 also summarizes the sample frequency. Generally, as Superfund projects enter the long term operation and maintenance (O&M) phase, data collection occurs less frequently over time. Table 3 includes this type of frequency adjustment over time.

Groundwater sampling will be performed by a field scientist experienced in environmental sampling. A copy of this plan and QAPP will be given to and used by the field scientist to facilitate compliance during field sampling. File copies of these plans will also be kept at TRC offices.

If weather conditions are extremely rainy or snowy on the day of sampling, efforts will be made to prevent precipitation from coming into contact with the sample, sample bottle, or sampling equipment. If this cannot be attained, sampling will be postponed until better weather conditions prevail.

The monitoring wells will be identified with the well permit number and well identification number. Also, each well will have a permanent, readily identified reference point to facilitate accurate water level measurements.

In accordance with USEPA and NJDEP Guidance for evaluating natural attenuation of organics and inorganics (USEPA, 2004b and 2007; NJDEP, 2012), the monitoring network includes wells in the former release areas (where concentrations were historically highest), along the centerline of the plume, and near the boundaries of the plume.

2.2 Water Level Measurements

Water level measurements will be collected with an electronic water level indicator to the nearest one hundredth of a foot (0.01). Well measurements will be made prior to the evacuation of any wells which may influence groundwater elevations in the area of investigation. In order to assure accuracy, measurements will be collected from the same survey point. The water level indicator will be properly decontaminated between wells as discussed in Section 9.2 of the QAPP. A second water level indicator will be used as a backup if required.

Water level data will be documented in field log books and/or on a field sampling form. The data will be used to develop appropriate groundwater equipotential contour maps and document groundwater flow direction. Based upon over 30 years of groundwater monitoring, the groundwater flow direction is to the southwest and is not expected to change.

2.3 Groundwater Indicator Parameters

Groundwater quality indicator parameters (i.e., temperature, pH, specific conductance, DO, ORP, and turbidity) will be measured during well purging using an electronic measuring device (e.g., Horiba U-22, etc.) and a flow cell. Baseline measurements will be collected at the start of purging and will be collected at approximately 5 minute intervals after purging one well screen volume until 3 consecutive measurements meet the following criteria:

- pH does not vary by greater than $\pm$ 0.1 standard pH units;
- Specific conductance and temperature do not vary by more than 3 percent;
- ORP does not vary by greater than 10 millivolts;
- Dissolved oxygen does not vary by greater than 10 percent for concentrations >0.5 milligrams per liter (mg/L). Three consecutive values <0.5 mg/L will be considered stable; and
- Turbidity does not vary by more than 10 percent for values above 1 nephelometric turbidity units (NTU).

Measurements of indicator parameters will be recorded on field sampling forms. Upon achieving stabilization criteria, the discharge line will be disconnected from the flow cell and samples will be collected from the discharge line of the pump directly into laboratory supplied bottleware. If stabilization is not attained within 4 hours, samples will be collected as described above and the inability to achieve the stabilization criteria will be documented by the sampling team in a field notebook.

2.4 Well Evacuation

Groundwater samples will be collected using USEPA's low-flow (minimal drawdown) purge method, which is an appropriate procedure for sites with metals concerns. After water level measurements are collected, the volume of water in each well screen interval will be calculated using the known well diameter, the screen length, and water level (where the water level intersects the screen). One well screen volume will be calculated by multiplying well screen length (or water column height when the static water level intersects the screen) by a well diameter conversion factor (i.e., 2-inch well - 0.163; 4-inch well - 0.653; 6-inch well - 1.469) to obtain one well purge volume in gallons. At locations where pairs of nested monitoring well screens are present, the well screened in the shallow portion will be purged and sampled first followed by the deeper-screened wells.

Each well will be purged using a bladder pump or a submersible pump equipped with a well-dedicated discharge line installed near the center of the screen interval, consistent with the sampling protocol previously approved by USEPA and NJDEP for the ISR injection area. During evacuation, care will be taken to avoid over-pumping or pumping the well to dryness. The well will be purged at an approximate flow rate of 0.5 liters per minute or less and drawdown will be limited to 0.3 feet or less, to the extent practicable. Where samples are to be collected for analysis of CVOCs, the discharge line will be Teflon-lined. At wells sampled for metals only, polyethylene discharge line will be used.

During purging, field indicator parameters will be monitored using a flow cell as described in Section 2.3.

Upon achieving stabilization criteria, the discharge line will be disconnected from the flow cell and samples will be collected directly into laboratory supplied bottleware.

Upon completing sampling at each well, the pump will be removed from the well and the discharge line will be disconnected from the pump and returned to the well or coiled and stored in a clean trash bag labeled with the well ID for reuse during the next sampling event. If the discharge line is stored in a trash bag, the line will be wiped down with distilled water prior to being reused at the designated well location. The pump, flow cell, and probes used to monitor field indicator parameters will be decontaminated prior to use at the next well following the procedure described in Section 9.2 of the QAPP and as recommended by the manufacturer. Decontamination fluids will be managed as investigation derived waste.

2.5 Investigation-Derived Waste

During the performance of the OU1 monitoring, certain types of investigation-derived wastes may be generated and require disposal including spent personal protective equipment (PPE) and sampling materials, discarded packaging, decontamination fluids, and purge water. Spent PPE, used sampling material (e.g., damaged or spent discharge line that is not easily decontaminated for reuse), and discarded packaging will be disposed in an appropriate receptacle and managed as solid waste. Decontamination fluids are anticipated to contain highly dilute concentrations of Site-related constituents below ARARs. Therefore, decontamination fluids will be dispersed on the ground surface and permitted to recharge soils at the decontamination area in a manner that does not cause erosion or cause runoff into surface water. Equipment decontamination will be performed at each well location following sampling prior to proceeding to the next well location.

Water pumped during the purging process from wells exhibiting concentrations of Site-related constituents above ARARs will be containerized for off-site disposal at a licensed facility as investigation-derived waste. At locations where groundwater concentrations meet ARARs, purge water will be discharged to the ground surface immediately adjacent to the well. Care will be taken to minimize splashing of water during pumping. When discharging purge water to the ground surface, the water will not be permitted to migrate directly into surface water or cause erosion.

In addition to the investigation-derived wastes described above, slightly acidic groundwater may be generated periodically as a result of well redevelopment, if performed, along with empty containers used to store reagents for well redevelopment. Residuals generated during redevelopment will be containerized and disposed at a licensed off-site treatment and disposal facility. Empty containers used to store reagents for well development will be disposed of in accordance with federal, state, and local regulations.

2.6 Groundwater Sampling Procedures

2.6.1 Sampling Equipment

Groundwater samples will be obtained after at least one well screen volume has been purged from the well and field indicator measurements have stabilized as described above. Samples will be collected from the discharge lines of bladder or stainless steel submersible pumps used to purge the wells. Discharge tubing dedicated to each well will be used for purging and sampling. For wells sampled for CVOCs, discharge tubing will be Teflon-lined. Polyethylene tubing will be used at locations sampled for metals only. New surgical gloves will be used at each sample location to prevent cross contamination and will be changed when soiled and prior to collecting samples. Clean sampling equipment and any other objects entering the well shall not be allowed to contact the ground or any other potentially contaminated surfaces. If this should occur, that item will not be placed in the well or utilized for sampling unless thoroughly decontaminated.

Pumps, associated cable and water level indicators will be decontaminated in accordance with procedures outlined in the QAPP. Decontamination of the field parameter probe and cable will be accomplished prior to placing the probe and cable into each well using a distilled water rinse per the manufacturer's directions.

2.6.2 Sample Containers

Containers used for retaining groundwater samples will be provided by the laboratory conducting the analysis. Sample containers requiring preservatives will be pre-preserved at the laboratory. No preservation of samples will be conducted in the field.

Sample containers provided by the laboratory will be placed in custody-sealed coolers for shipment or pick-up. The custody seals will be inspected upon receipt to verify whether or not the sample containers may have been tampered with.

Following sample collection, each sample will be logged on a chain-of-custody form, and placed into coolers and kept on ice to maintain a cooler temperature of approximately 4 degrees Centigrade (4ºC).

Prior to shipment to the laboratory, care will be taken to avoid contamination of the sample containers. Sample coolers and containers will be stored and transported in secure and clean environments. Sample containers and equipment will not be stored near solvents, gasoline, vehicle exhaust or other equipment that is a potential source of contamination (NJDEP, 2005).

2.6.3 Sample Shipment

Following sampling activities, all samples will be inspected to insure they are tightly capped and labeled properly. Sample containers and the chain-of-custody forms will then be placed into the coolers, and the coolers will be custody-sealed. Sample coolers will then be submitted to the analytical laboratory under chain-of-custody via hand-delivery, courier pickup or overnight shipment (e.g., Federal Express, etc.). Samples will not be held overnight (i.e., samples will be shipped, picked up or hand delivered on the day the samples are collected).

When under chain-of-custody, sample bottles must be secured in locked vehicles, custody-sealed in coolers or in the presence of authorized personnel.

2.6.4 Well Sampling Analysis

The wells included in the routine groundwater sampling program will be analyzed for parameters identified in Table 3.

2.7 Well Maintenance Activities

It is appropriate to continually assess the monitoring well network during long term O&M.

During monitoring events, the condition of wells could be assessed for the following:

- Condition of the surface seal and protective casing;
- Presence of well caps/expansion plugs;
- Condition of locks, as applicable;
- Presence of excessive turbidity; and
- Drawdown and recovery rates.

Damaged surface seals, casings, and locks will be repaired/replaced. Similarly, missing or damaged caps/expansion plugs will be repaired/replaced.

Also, elevated levels of turbidity may affect data quality. In the event that well turbidity is observed to be reducing data quality (e.g. based on field observations or sample results), the well may be redeveloped or replaced. In the event that the well is replaced, TRC will notify the USEPA of the activity, then the existing well will be abandoned by pressure grouting, a new well will be installed in its place with an identical well screen interval, and the well will be redeveloped. If the well being replaced has two screen intervals, the screen for the replacement well will be installed only at the interval being monitored. Soil samples will not be collected from replacement well locations. Residuals generated from replacement well installations will be characterized and disposed in accordance with federal, state, and local regulations.

If performed, well redevelopment, will be conducted in the following manner by a licensed well drilling contractor:

- A groundwater sample will be collected from the well screen interval using a bailer and the baseline groundwater pH will be measured using a pH test strip or calibrated pH meter;

- An appropriate dose of acid (e.g., muriatic acid) or other appropriate reagent will be introduced into the well screen interval using a tremie pipe or other suitable method;
- A surge block will be used to distribute the treated groundwater across the well screen and loosen incrusted solids and precipitates on the well screen and in the adjacent sand pack;
- The inside of the well will be swabbed using a clean sorbent pad; and
- The well will be pumped to remove loosened particulates and acidified groundwater. Purge water will be monitored for pH using test strips or a calibrated pH meter.

Purging will continue until the pH of the discharge water returns to baseline conditions ± 0.5 pH units. Purge water generated during redevelopment, if performed, will be containerized and disposed of as investigation-derived waste.

Sometimes unused wells should be abandoned, to eliminate potential pathways, and/or to accommodate other site uses and activities. In the event that well abandonment is appropriate, TRC will notify the USEPA prior to execution. A licensed well driller will perform the abandonment, in accordance with New Jersey procedures, and will process appropriate well permits.

2.8 Passive Sampling Consideration

It is appropriate to consider sampling technique and technology as it progresses over time. Passive sampling techniques (e.g. Hydrasleeves®) can sometimes be an effective means to provide quality data, particularly in the long-term O&M phase. For the SMC project, it may be appropriate to consider passive sampling techniques at such time as it has been determined that geochemical conditions have reached equilibrium. At that time, TRC may perform an evaluation to assess if passive sampling methods can provide comparable data to the low-flow sampling protocol. TRC would notify the USEPA prior to performing analogous field work, and, if appropriate, submit a plan adjustment request to the USEPA.

If performed, this evaluation will involve collecting co-located samples for a targeted population of wells from the same vertical position within the well screen using both the passive sampling device and the low-flow sampling protocol. The results would be compared to evaluate the relative percent difference (RPD) between the co-located samples. If the set of co-located samples generally exhibit RPDs similar to acceptance criteria for field duplicate analyses (i.e., within ± 30 percent), the passive sampling method will be considered to provide comparable data and may be implemented with approval from USEPA and an amendment to the QAPP.

In the event that passive sampling devices are implemented, groundwater quality indicator parameters (i.e., temperature, pH, specific conductance, dissolved oxygen, and ORP) will be measured in-situ in the well using an electronic measuring device (e.g., Horiba U-22, or an equivalent meter). The electronic measuring device probe and cable would be carefully lowered to the mid-point of the well screen after collecting the sample with the passive sampling device. Once the probe is lowered to the appropriate depth in the well, it will be allowed to sit in the well for several minutes while the parameter readings stabilize. Once the parameter readings have stabilized, they will be recorded in the field logbook or on a field sampling form. After the readings are recorded, the probe and cable will be carefully removed from the well. A separate aliquot will be obtained from the passive sampling device and measured for turbidity using a portable turbidity meter. Upon removal, water quality meters will be decontaminated in accordance with procedures described in Section 9.2 of the QAPP. Modifications, as needed, will be presented in an amendment to the QAPP.

3.0 REPORTING AND SCHEDULE

This OU1 Monitoring Plan will be implemented starting October 2014.

Monitoring Reports will be prepared to document activities conducted during long-term monitoring events. A Monitoring Report will include a summary and discussion of the groundwater sample results and groundwater conditions, as appropriate. The Monitoring Reports will be supported with appropriate lab data, validation results, maps, figures, and tables. Long term monitoring will focus attention on the sentinel wells, as the key compliance points. The Monitoring Reports will discuss results for the compliance points and geochemical conditions throughout the plume.

TRC will submit the Monitoring Report to the EPA electronically in PDF format.

Monitoring Report submission timing should reflect sample event frequency, and will be submitted no less than every two sampling events (within 6 months of the latest sampling event). The timing of the Monitoring Reports could be made to synchronize with the USEPA-required 5-year review cycle.

Appropriate evaluations will be included in the Monitoring Reports, considering how the site is progressing in meeting OU1 Monitoring Plan objectives, established MNA concentration targets, and the objectives established in the OU1 ROD Modification. For example, statistical analyses of the data, calculations, completed sample data forms and laboratory reports will be provided as appropriate. In former source areas, incremental concentration changes over time are anticipated to be small for several years. At sentinel locations, concentrations should be relatively stable. Data variation over time is normal and is to be expected. The USEPA/NJDEP procedures to assess MNA progress can be performed consistent with the methodologies already performed on the project.

If the evaluation shows that certain concentration trends are inconsistent with project objectives at certain locations, the Monitoring Report would include recommendations for additional steps (e.g. additional sampling or studies/modeling).

4.0 REFERENCES

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USEPA, 2005. Uniform Federal Policy for Quality Assurance Project Plans, Intergovernmental Data Quality Task Force, EPA-505-B-04-900A-C, March 2005.

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TABLES

Table 1
Chemical-Specific
Applicable, Relevant, and Appropriate Requirements
OU1 Groundwater
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Analyte		Federal MCL	NJDEP Drinking Water Criterion	NJDEP GWQS
Volatile Organic Compounds (μg/L)				
Trichloroethene		5	1	1
cis-1, 2-Dichloroethene		70	70	70
trans-1,2-Dichloroethene		100	100	100
Vinyl Chloride		2	2	0.08
Metals(μg/L)				
Total Chromium		100	100	70
Hexavalent Chromium		NS	NS	NS
Aluminum		200*	200*	200
Antimony		6	6	6
Beryllium		4	4	1
Manganese		50*	50*	50
Nickel		NS	NS	100
Vanadium		NS	NS	60**

Notes:

MCL = U.S. EPA Maximum Contaminant Level
NJDEP = New Jersey Department of Environmental Protection
GWQS = Groundwater Quality Standard
μg/L = micrograms per liter
* = Secondary criterion based aesthetics (odor, taste) and not risk. To-be-Considered but not an ARAR.
** = Standard for vanadium pentoxide.
NS = No Standard.

Table 2
Monitoring Well Construction Details
Routine Monitoring Well Network
Shieldalloy Metallurgical Corporation Site
Newfield, New Jersey

WELL #	Location	Vertical Zone	PERMIT #	INSTALL DATE	CASING TYPE / DIAMETER	NJ State Plane Northing (NAD 83)	NJ State Plane Easting (NAD 83)	GROUND ELEVATION (msl) (1) (2)	TOP OF INNER CASING ELEVATION (msl) (2)	TOTAL WELL DEPTH (ft) (3)	SCREENED INTERVAL (ft) (3)	SCREENED INTERVAL ELEVATION (msl) (2)
UPPER ZONE MONITORING WELLS (0'-80' bgs)												
B	Facility	Intermediate	51-143	1970	STEEL/2"	257848.77	345001.55	*** 92.33	94.33	46	36 to 46	56.33 to 46.33
IW-1	Offsite	Intermediate	51-220	4/5/83	PVC/6"	256736.68	343421.73	89.06	90.33	62	32 to 62	57.06 to 27.06
IWC1	Facility	Shallow	51-220	1/74	STEEL/2"	258081.57	345435.37	**** 97	98.13	20	15 to 20	82.00 to 77.00
IWC2	Facility	Intermediate	51-221	1/74	STEEL/2"	258098.89	345408.41	**** 97	98.51	40	35 to 40	62.00 to 57.00
K	Facility	Intermediate	51-152	1971	STEEL/2"	258009.39	344799.54	*** 97.18	99.18	46	36 to 46	61.18 to 51.18
LAYNE	Facility	Intermediate	51-154	1971	STEEL/6"	257876.64	344900.79	*** 92.11	94.11	48	43 to 48	49.11 to 44.11
SC-2I	Offsite	Intermediate	E201115771	10/5/2011	PVC/2"	256920.72	343302.22	89.46	91.46	65	55 to 65	34.46 to 24.46
SC-3S	Offsite	Intermediate	31-28914-2	6/8/88	PVC/4"	256554.42	343024.30	*** 88.32	90.32	55	35 to 55	53.32 to 33.32
SC-6S	Offsite	Intermediate	31-21691-5	6/21/84	PVC/2"	257438.38	344342.17	90.34	92.28	75	45 to 75	47.62 to 17.62
SC-10S	Offsite	Intermediate	31-23369	11/11/85	PVC/4"	257372.45	344614.75	*** 93.38	95.38	55	35 to 55	58.38 to 38.38
SC-14S	Facility	Shallow	31-35215-4	11/15/90	PVC/4"	258756.71	346066.60	105.83	108.38	27	12 to 27	93.83 to 78.83
SC-20S	Facility	Shallow	31-35218-3	11/13/90	PVC/4"	258569.13	345451.06	100.57	103.16	22	7 to 22	93.57 to 78.57
SC-23S	Facility	Shallow	31-35437-8	11/16/90	PVC/4"	258820.57	345131.37	102.83	102.21	24	9 to 24	93.83 to 78.83
SC-38I	Offsite	Intermediate	E201013062	11/15/10	PVC/2"	257489.54	344226.92	91.11	90.86	50	40 to 50	46.11 to 36.11
U7-A	Offsite	Intermediate	E201204600	4/6/12	PVC/4"	257115.87	343419.61	89.24	88.15	65	45 to 65	44.24 to 24.24
U8-C	Offsite	Intermediate	E201208015	6/21/12	PVC/4"	256909.64	343348.76	87.01	85.78	65	45 to 65	42.01 to 22.01
U8-E	Offsite	Intermediate	E201210489	7/19/12	PVC/4"	257008.11	343234.13	90.45	89.25	66	45 to 65	45.45 to 25.45
W-4	Facility	Intermediate	51-219	5/8/74	PVC/4"	258306.92	344698.24	*** 102.58	104.58	75	55 to 75	47.58 to 27.58
SC-1S(4)	Offsite	Intermediate	31-28825-1	6/22/1988	PVC/4"	256321.53	342741.79	*** 85.26	87.26	55	35 to 55	47.58 to 27.58

Notes:
(1) - Well locations without surveyed ground elevations calculated assuming a ground elevation of 2 feet below the surveyed well elevation (denoted by ***).
(i.e., top of inner casing elevation). For locations where the stickup is less than 2 feet, the ground surface elevation estimated from
contour map (denoted by ****).
(2) - All elevations based on vertical datum NGVD 1929
(3) - Feet Below Grade
(4) -Well will be added if chromium concentration at SC-3S (or SC-3D) exceeds 70 µg/L GWQS.
(5) - Well has a large screen interval and the sample depth was selected as 115 ft below ground surface, which historically had higher concentrations than the shallower samples.
(6) - Well consists of two screen intervals. The sample depth was selected from the deeper interval at 110 ft below ground surface, which historically had higher concentrations than the shallower interval.
^ - USGS observation well (NJ-WRD Well Number 15-0372) land surface is 120 feet above NGVD 1929, with the measuring point 2.80 ft above
the land surface. The total well depth is 154 feet, with a screened interval of 129-149 feet below grade. (USGS Water Resources Data, New
Jersey Water Year 2002 Vol. 2: Water Data Report NJ-02-2)
Bold indicates former pumping wells converted to monitoring wells as of May 2014
msl - Feet Above Mean Sea Level
ft - Feet
NM - Not Measured
UKN - Unknown

Table 2
Monitoring Well Construction Details
Routine Monitoring Well Network
Shieldalloy Metallurgical Corporation Site
Newfield, New Jersey

WELL #	Location	Vertical Zone	PERMIT #	INSTALL DATE	CASING TYPE / DIAMETER	NJ State Plane Northing (NAD 83)	NJ State Plane Easting (NAD 83)	GROUND ELEVATION (msl) (1) (2)	TOP OF INNER CASING ELEVATION (msl) (2)	TOTAL WELL DEPTH (ft) (3)	SCREENED INTERVAL (ft) (3)	SCREENED INTERVAL ELEVATION (msl) (2)
LOWER ZONE MONITORING WELLS (~80'-153' bgs)												
IWC5	Facility	Deep	51-224	1/74	STEEL/2"	258080.84	345405.17	**** 97.00	98.03	100	95 to 100	2.00 to -3.00
L8-A2	Offsite	Deep	E201204596	4/9/12	PVC/4"	257000.53	343234.61	90.36	89.32	111	95 to 110	-4.64 to -19.64
L8-D2	Offsite	Deep	E201208012	6/20/12	PVC/4"	256901.57	343356.71	86.58	85.16	110	95 to 110	-8.42 to -23.42
LPW-8	Offsite	Deep	E201208027	6/29/12	PVC/4"	257021.80	343362.63	89.58	91.9	90	80 to 90	9.58 to -0.42
PZ-3	Facility	Deep	E201008876	8/13/10	PVC/4"	257852.87	345646.60	95.83	98.13	121	111 to 121	-15.17 to -25.17
SC-2D(R)	Offsite	Deep	31-38194	1/3/92	PVC/4"	256927.50	343294.26	89.46	91.32	116	106 to 116	-16.54 to -26.54
SC-3D(R)	Offsite	Deep	31-38195	1/7/92	PVC/4"	256565.25	343005.57	88.75	91.06	112	102 to 112	-13.25 to -23.25
SC-5D/115(5)	Offsite	Deep	31-21876-8	6/12/84	PVC/2"	257063.55	343086.73	93.04	95.88	120	90 to 120	3.04 to -26.96
SC-6D	Offsite	Deep	31-21878-4	6/26/84	PVC/2"	257451.79	344346.22	90.77	93.12	125	110 to 120	-17.62 to -27.62
SC-10D	Offsite	Deep	31-23370	11/12/85	PVC/4"	257371.58	344644.22	*** 93.72	95.72	125	105 to 125	-11.28 to -31.28
SC-24D	Offsite	Deep	31-42083	8/24/93	PVC/4"	256745.02	342464.31	*** 91.52	93.52	115	105 to 115	-13.48 to -23.48
SC-26D	Offsite	Deep	31-39500	7/9/92	PVC/4"	257275.15	345657.81	100.68	100.45	137	127 to 137	-26.32 to -36.32
SC-28D	Offsite	Deep	31-47408	8/16/95	PVC/4"	256924.27	344710.57	107.41	106.87	153	133 to 153	-25.59 to -45.59
SC-35D	Offsite	Deep	P200913690	10/29/09	PVC/2"	251028.32	335041.45	80.03	80.03	100	90 to 100	-9.97 to -19.97
SC-41D	Offsite	Deep	E201115767	10/08/11	PVC/4"	257711.24	344310.49	93.59	93.34	130	120 to 130	-26.41 to -36.41
SC-42D	Offsite	Deep	E201115768	10/5/11	PVC/4"	256741.78	343423.23	87.30	89.47	120	110 to 120	-22.70 to -32.70
W3D	Facility	Deep	31-25759	12/5/86	PVC/4"	258635.57	346226.30	*** 105.85	107.85	108	88 to 108	17.85 to -2.15
W9	Facility	Deep	31-19648	10/17/82	PVC/6"	257871.90	344961.37	*** 92.43	94.43	130	110 to 130	-17.57 to -37.57
SC-1D/110(4)(6)	Offsite	Deep	31-21619-6	5/30/84	PVC/2"	256175.58	342357.96	88.00	90.9	115	100 to 115	-17.57 to -37.57

Notes:
(1) - Well locations without surveyed ground elevations calculated assuming a ground elevation of 2 feet below the surveyed well elevation (denoted by ***).
(i.e., top of inner casing elevation). For locations where the stickup is less than 2 feet, the ground surface elevation estimated from
contour map (denoted by ****).
(2) - All elevations based on vertical datum NGVD 1929
(3) - Feet Below Grade
(4) -Well will be added if chromium concentration at SC-3S (or SC-3D) exceeds 70 µg/L GWQS.
(5) - Well has a large screen interval and the sample depth was selected as 115 ft below ground surface, which historically had higher concentrations than the shallower samples.
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Jersey Water Year 2002 Vol. 2: Water Data Report NJ-02-2)
Bold indicates former pumping wells converted to monitoring wells as of May 2014
msl - Feet Above Mean Sea Level
ft - Feet
NM - Not Measured
UKN - Unknown

TABLE 3
OPERABLE UNIT 1 (OU-1)
ROUTINE GROUNDWATER MONITORING PROGRAM
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

			Analytes				
Well ID[1]	**Location**	**Spatial Position**	**Total & Hexavalent Chromium**	**Selected Metals[2], [3]**	**CVOCs[4]**	**Field Indicators[5]**	**Water Level**
		Upper Zone of Aquifer					
SC-14S	Facility	Background Location	•	•		•	•
K	Facility	Center of Plume	•	•	•	•	•
Layne	Facility	Center of Plume	•		•	•	•
SC-6S	Car Wash	Center of Plume	•	•	•	•	•
U7-A	Farm Parcel	Center of Plume	•			•	•
U8-C	Farm Parcel	Center of Plume	•			•	•
SC-2I	Farm Parcel	Center of Plume	•	•	•	•	•
SC-20S	Facility	Center of Plume			•	•	•
IWC-1	Facility	Historical Center of Plume	•	•		•	•
IWC-2	Facility	Historical Center of Plume	•	•		•	•
B	Facility	Fringe of Plume	•		•	•	•
SC-10S	Car Wash	Fringe of Plume	•			•	•
SC-38I	Car Wash	Fringe of Plume	•			•	•
U8-E	Farm Parcel	Fringe of Plume	•			•	•
SC-23S	Facility	Fringe of Residual Plume	•	•		•	•
IW-1	Farm Parcel	Sentinel Location	•			•	•
SC-3S[6]	Farm Parcel	Sentinel Location	•		•	•	•
W-4	Facility	Sentinel	•			•	•
		Lower Zone of Aquifer					
W3D		Background Location	•		•	•	•
W-9	Facility	Center of Plume	•		•	•	•
PZ-3	Facility	Former Source Area	•			•	•
IWC-5	Facility	Center of Plume	•			•	•
SC-6D	Car Wash	Center of Plume	•		•	•	•
SC-10D	Car Wash	Center of Plume	•			•	•
SC-41D	Farm Parcel	Center of Plume	•			•	•
SC-2D (R)	Farm Parcel	Center of Plume	•		•	•	•
LPW-8	Farm Parcel	Center of Plume	•			•	•
L8-A2	Farm Parcel	Center of Plume	•			•	•
L8-D2	Farm Parcel	Center of Plume	•			•	•
SC-5D/115	Farm Parcel	Fringe of Plume	•		•	•	•
SC-26D	Weymouth Rd	Fringe of Plume	•			•	•
SC-28D	Farm Parcel	Fringe of Plume	•		•	•	•
SC-3D(R)[6]	Farm Parcel	Sentinel Location	•		•	•	•
SC-24D	Farm Parcel	Sentinel Location	•			•	•
SC-35D	Farm Parcel	Compliance Location			•	•	•
SC-42D	Farm Parcel	Sentinel Location	•			•	•

Notes:

	Sampling Frequency:	Reporting Frequency
Years 1 - 2	Semiannual	Annual
Years 3 - 5	Annual	Biannual (i.e., year 4)
Years 6 - 10	Biannual	Biannual (Years 6, 8 and 10)
Years 11- 30	Every 5 years	Every 5 years

(1) - The ongoing remediation and plume studies have shown that the plume is currently under active remediation conditions. As the aquifer returns to equilibrium, the sampling network may be reduced with EPA notification and approval.

(2) - Selected metals include aluminum, antimony, beryllium, manganese, nickel and vanadium. These metals will be sampled from upper zone wells to evaluate concentrations of these analytes in shallow groundwater potentially associated with soils, as indicated in the OU2 RI.

(3)- If concentrations of these selected metals are found to be below EPA/NJDEP groundwater criteria for two consecutive monitoring events, these analyte will be dropped from the monitoring program.

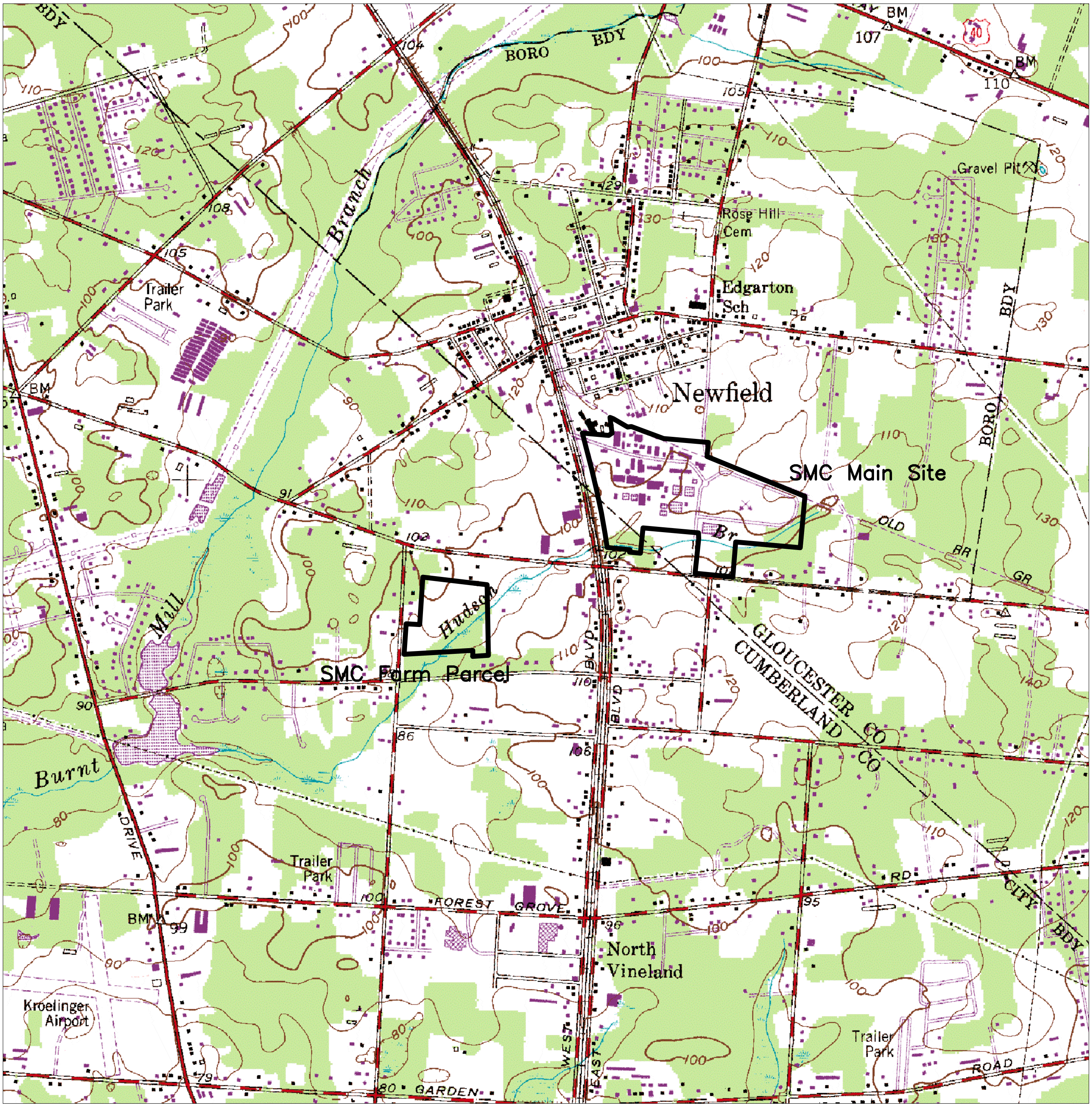
(4) - CVOCs will include trichloroethene. Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride may be analyzed for a period of time to provide some data. Wells downgradient of the facility may discontinue CVOC analysis at an appropriate point in the future. TRC will notify and seek EPA approval at that time.

(5) - Field Indicators = pH, Temperature, Specific Conductance, Dissolved Oxygen, Redox Potential, and turbidity.

(6) - If concentrations of total chromium at SC-3S or SC-3D (R) increase above 70 μg/L, SC-1S and/or SC-1D/110 will be added to the monitoring program for analysis of total and hexavalent chromium.

If, during implementation of the monitoring program it is statistically determined that certain concentrations are increasing, TRC will recommend and implement appropriate steps, such as additional sampling/analysis or modeling. Similarly, if certain wells are statistically determined to provide little useful data, TRC may recommend and implement a reduction in well sampling.

FIGURES



SOURCE: NEWFIELD, N.J. QUADRANGLE, 1953, PHOTOREVISED 1994,
7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)

SITE PROPERTY BOUNDARY

N

0 2000 FT.

APPROXIMATE SCALE

QUADRANGLE LOCATION

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

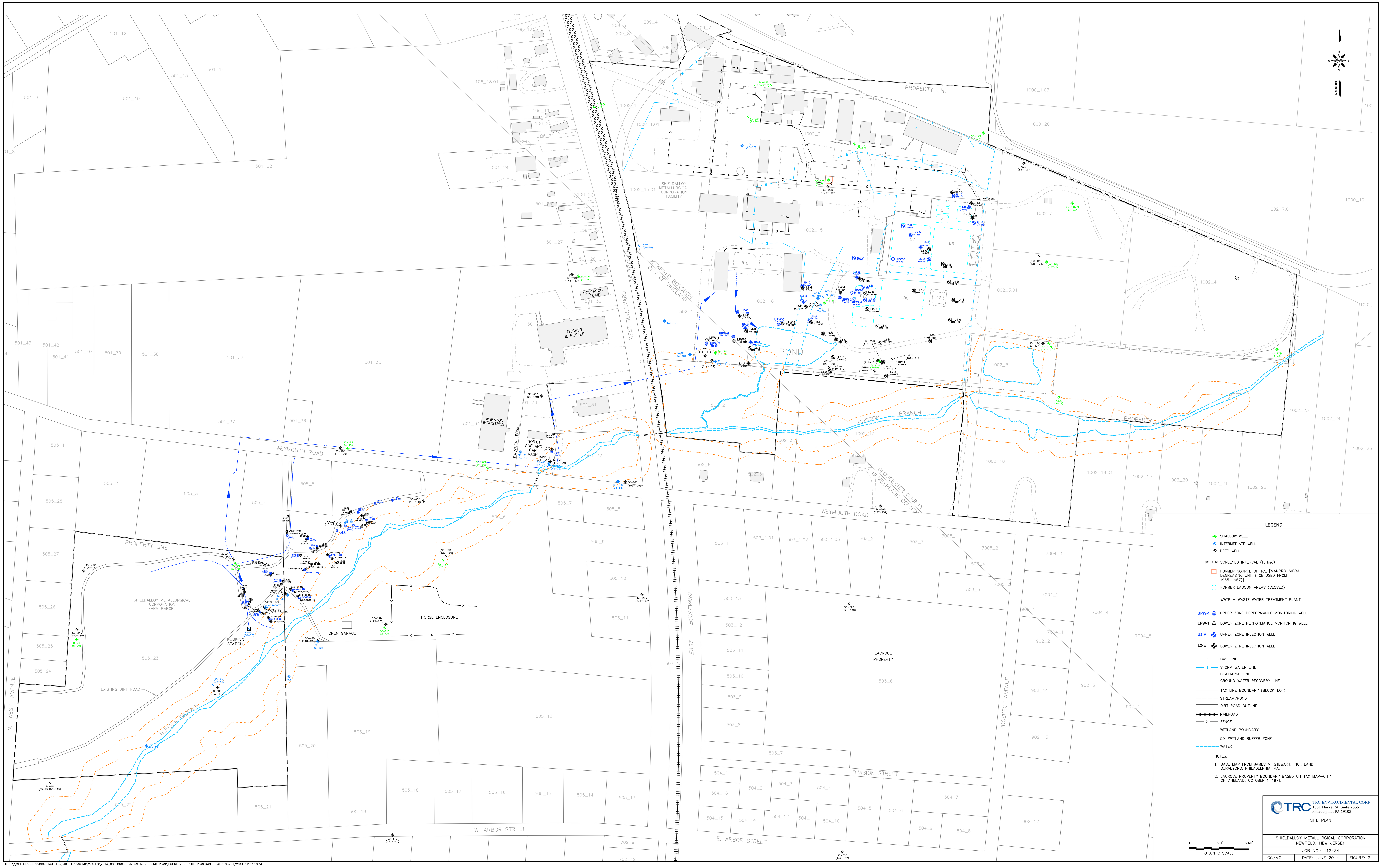
SITE LOCATION MAP

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NO.: 2710ES–112434

BR/TH	DATE: FEBRUARY 2013	FIGURE: 1

\\MILLBURN-FP2\DRAFTINGFILES\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 1 – SITE LOCUS.DWG 08/01/2014 12:51:58PM TAB: LAYOUT


PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION FACILITY
POND
HUDSON BRANCH
WEYMOUTH ROAD
WEST BOULEVARD
EAST BOULEVARD
PROSPECT AVENUE
DIVISION STREET
W. ARBOR STREET
E. ARBOR STREET
N. WEST AVENUE
NEWFIELD BOROUGH
CITY OF VINELAND
GLOUCESTER COUNTY
CUMBERLAND COUNTY
FISCHER & PORTER
RESEARCH GLASS
WHEATON INDUSTRIES
NORTH VINELAND CAR WASH
PAVEMENT EDGE
LACROCE PROPERTY
HORSE ENCLOSURE
OPEN GARAGE
PUMPING STATION
EXISTING DIRT ROAD
SHIELDALLOY METALLURGICAL CORPORATION FARM PARCEL
LEGEND
SHALLOW WELL
INTERMEDIATE WELL
DEEP WELL
(93–126) SCREENED INTERVAL (ft bsg)
FORMER SOURCE OF TCE [MANPRO–VIBRA DEGREASING UNIT (TCE USED FROM 1965–1967)]
FORMER LAGOON AREAS (CLOSED)
WWTP = WASTE WATER TREATMENT PLANT
UPW-1 UPPER ZONE PERFORMANCE MONITORING WELL
LPW-1 LOWER ZONE PERFORMANCE MONITORING WELL
U2-A UPPER ZONE INJECTION WELL
L2-E LOWER ZONE INJECTION WELL
G GAS LINE
S STORM WATER LINE
DISCHARGE LINE
GROUND WATER RECOVERY LINE
TAX LINE BOUNDARY (BLOCK_LOT)
STREAM/POND
DIRT ROAD OUTLINE
RAILROAD
X FENCE
WETLAND BOUNDARY
50' WETLAND BUFFER ZONE
WATER
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP–CITY OF VINELAND, OCTOBER 1, 1971.
0 120' 240'
GRAPHIC SCALE
TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103
SITE PLAN
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434
CG/MG
DATE: JUNE 2014
FIGURE: 2

CONCENTRATION KEY

Number	MINIMUM CONCENTRATION (ug/l))	COLOR
1	100–750	
2	>750	

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

TOTAL CHROMIUM PLUME

UPPER ZONE – APRIL 2014

SHIELDALLOY METALLURGICAL CORPORATION

NEWFIELD, NEW JERSEY

JOB NO.: 112434

SS / JB | JUNE 2014 | FIGURE: 3

FILE: \\MILLBURN-FP2\DRAFTINGFILES\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 3 - TOTAL CHROME PLUME - UPPER ZONE.DWG 08/01/14 02:03:19PM, dshapiro, LAYOUT:SITE PLAN

LEGEND

HYDROLOGIC ZONE (COLOR)	WELL TYPE (SYMBOL)
SHALLOW WELL	PERFORMANCE MONITORING WELL
INTERMEDIATE WELL	MONITORING WELL
DEEP WELL	INJECTION WELL

SC-27S (7-22) 10.5
- WELL IDENTIFIER (COLOR/SYMBOL)
- WELL ID
- SCREENED INTERVAL (ft. bgs)
- PARAMETER VALUE/RESULT

G — GAS LINE
S — STORM WATER LINE
DISCHARGE LINE
GROUND WATER RECOVERY LINE
TAX LINE BOUNDARY (BLOCK_LOT)
STREAM/POND
DIRT ROAD OUTLINE
RAILROAD
X — FENCE
WATER

Cr = CHROMIUM (ug/l)
Cr(VI) = HEXAVALENT CHROMIUM (ug/l)
TCE = TRICHLOROETHENE (ug/l)
NS = NOT SAMPLED
ND = NOT DETECTED
NA = NOT ANALYZED
NI = NOT INSTALLED DURING THE CORRESPONDING SAMPLING EVENT
* = ADDITIONAL SAMPLE DEPTH AT 110 FEET BELOW GROUND SURFACE

NOTES:

1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
3. ISOPLETH CONTOURS BASED ON SAMPLES COLLECTED IN APRIL 2014.

CONCENTRATION KEY

Number	MINIMUM CONCENTRATION (ug/l))	COLOR
1	100-1250	
2	>1250	

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

TOTAL CHROMIUM PLUME
LOWER ZONE - APRIL 2014
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434

SS / JB	JUNE 2014	FIGURE: 4

FILE: \\MILLBURN-FP2\DRAFTINGFILES\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 4 - TOTAL CHROME PLUME - LOWER ZONE.DWG 08/01/14 02:07:47PM, dshapiro, LAYOUT:SITE PLAN

LEGEND

HYDROLOGIC ZONE (COLOR)	WELL TYPE (SYMBOL)
SHALLOW WELL	PERFORMANCE MONITORING WELL
INTERMEDIATE WELL	MONITORING WELL
DEEP WELL	INJECTION WELL

SC-27S (7-22) 10.5 — WELL IDENTIFIER (COLOR/SYMBOL); WELL ID; SCREENED INTERVAL (ft. bgs); PARAMETER VALUE/RESULT

G — GAS LINE
S — STORM WATER LINE
DISCHARGE LINE
GROUND WATER RECOVERY LINE
TAX LINE BOUNDARY (BLOCK_LOT)
STREAM/POND
DIRT ROAD OUTLINE
RAILROAD
X — FENCE
WATER

Cr = CHROMIUM (ug/l)
Cr(VI) = HEXAVALENT CHROMIUM (ug/l)
TCE = TRICHLOROETHENE (ug/l)
NS = NOT SAMPLED
ND = NOT DETECTED
NA = NOT ANALYZED
NI = NOT INSTALLED DURING THE CORRESPONDING SAMPLING EVENT
* = ADDITIONAL SAMPLE DEPTH AT 110 FEET BELOW GROUND SURFACE

NOTES:

1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
3. ISOPLETH CONTOURS BASED ON SAMPLES COLLECTED IN APRIL 2014.
4. MULTIPLE NON-SMC SOURCES OF CHLORINATED VOLATILE ORGANIC COMPOUNDS WERE PREVIOUSLY IDENTIFIED AND REPORTED(OU1 SUPPLEMENTAL RI REPORT, TRC, JANUARY 2011) TO CONTRIBUTE TO THE TCE PLUME.

CONCENTRATION KEY

Number	MINIMUM CONCENTRATION (ug/l))	COLOR
1	1-10	
2	10-100	

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

TRICHLOROETHENE PLUME
UPPER ZONE - APRIL 2014
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434

BL/MG	JUNE 2014	FIGURE: 5

FILE: \\MILLBURN-FP2\DRAFTINGFILES\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 5 - TCE PLUME - UPPER ZONE.DWG 08/01/14 02:10:38PM, dshapiro, LAYOUT:SITE PLAN

LEGEND

HYDROLOGIC ZONE (COLOR)	WELL TYPE (SYMBOL)
SHALLOW WELL	PERFORMANCE MONITORING WELL
INTERMEDIATE WELL	MONITORING WELL
DEEP WELL	INJECTION WELL

SC-27S — WELL IDENTIFIER (COLOR/SYMBOL) — WELL ID
(7-22) — SCREENED INTERVAL (ft. bgs)
10.5 — PARAMETER VALUE/RESULT

G — GAS LINE
S — STORM WATER LINE
DISCHARGE LINE
GROUND WATER RECOVERY LINE
TAX LINE BOUNDARY (BLOCK_LOT)
STREAM/POND
DIRT ROAD OUTLINE
RAILROAD
X — FENCE
WATER

Cr = CHROMIUM (ug/l)
Cr(VI) = HEXAVALENT CHROMIUM (ug/l)
TCE = TRICHLOROETHENE (ug/l)
NS = NOT SAMPLED
ND = NOT DETECTED
NA = NOT ANALYZED
NI = NOT INSTALLED DURING THE CORRESPONDING SAMPLING EVENT
* = ADDITIONAL SAMPLE DEPTH AT 110 FEET BELOW GROUND SURFACE

NOTES:

1. THE SENTINEL WELL SC-35D CONTINUES TO SHOW NON-DETECT (ND) RESULTS AND IS LOCATED APPROXIMATELY 8,820 FEET FROM THE FARM PARCEL PROPERTY BOUNDARY.
2. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
3. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
4. ISOPLETH CONTOURS BASED ON SAMPLES COLLECTED IN APRIL 2014.
5. MULTIPLE NON-SMC SOURCES OF CHLORINATED VOLATILE ORGANIC COMPOUNDS WERE PREVIOUSLY IDENTIFIED AND REPORTED(OU1 SUPPLEMENTAL RI REPORT, TRC, JANUARY 2011) TO CONTRIBUTE TO THE TCE PLUME.

CONCENTRATION KEY

Number	MINIMUM CONCENTRATION (ug/l)	COLOR
1	1-10	
2	10-100	

0 160' 320'
GRAPHIC SCALE

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

TRICHLOROETHENE PLUME

LOWER ZONE – APRIL 2014
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434

BL/MG	JUNE 2014	FIGURE: 6

FILE: \\MILLBURN-FP2\DRAFTINGFILES\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 6 - TCE PLUME - LOWER ZONE.DWG 08/01/14 02:13:04PM, dshapiro, LAYOUT: SITE PLAN


LEGEND
HYDROLOGIC ZONE (COLOR)
SHALLOW WELL
INTERMEDIATE WELL
DEEP WELL
WELL TYPE (SYMBOL)
PERFORMANCE MONITORING WELL
MONITORING WELL
INJECTION WELL
ROUTINE MONITORING PROGRAM SAMPLING LOCATION
WELL IDENTIFIER (COLOR/SYMBOL)
WELL ID
SCREENED INTERVAL (ft. bgs)
PARAMETER VALUE/RESULT
GAS LINE
STORM WATER LINE
DISCHARGE LINE
GROUND WATER RECOVERY LINE
TAX LINE BOUNDARY (BLOCK_LOT)
STREAM/POND
DIRT ROAD OUTLINE
RAILROAD
FENCE
WATER
Cr = CHROMIUM (ug/l)
Cr(VI) = HEXAVALENT CHROMIUM (ug/l)
TCE = TRICHLOROETHENE (ug/l)
NS = NOT SAMPLED
ND = NOT DETECTED
NA = NOT ANALYZED
NI = NOT INSTALLED DURING THE CORRESPONDING SAMPLING EVENT
* = ADDITIONAL SAMPLE DEPTH AT 110 FEET BELOW GROUND SURFACE
NOTES:
1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
3. ISOPLETH CONTOURS BASED ON SAMPLES COLLECTED IN APRIL 2014.
4. SEE TABLE 3 FOR PARAMETERS TO BE SAMPLED AT INDIVIDUAL WELL LOCATIONS.
CONCENTRATION KEY
Number | MINIMUM CONCENTRATION (ug/l)) | COLOR
1 | 100-750
2 | >750
PREDICTIVE MODELING USING EPA TOOLS INDICATES THAT MNA WILL EFFECTIVELY ADDRESS RESIDUAL TOTAL CHROMIUM AND TCE CONCENTRATIONS.
WELL WILL BE ADDED LOCATION TO LONG TERM PERFORMANCE MONITORING PROGRAM IF CHROMIUM CONCENTRATION AT SC-3S EXCEEDS 70 ug/L NJDEP GWQS
WEYMOUTH ROAD
E WEYMOUTH RD
W. ARBOR STREET
E. ARBOR STREET
DIVISION STREET
WEST BOULEVARD
EAST BOULEVARD
N. WEST AVENUE
PROSPECT AVENUE
HUDSON BRANCH
POND
WWTP
PROPERTY LINE
SHIELDALLOY METALLURGICAL CORPORATION FACILITY
SHIELDALLOY METALLURGICAL CORPORATION FARM PARCEL
LACROCE PROPERTY
FISCHER & PORTER
WHEATON INDUSTRIES
RESEARCH GLASS
NORTH VINELAND CAR WASH
HORSE ENCLOSURE
OPEN GARAGE
PUMPING STATION
EXISTING DIRT ROAD
NEWFIELD BOROUGH
CITY OF VINELAND
GLOUCESTER COUNTY
CUMBERLAND COUNTY
GRAPHIC SCALE
0 160' 320'
TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103
OU1 ROUTINE MONITORING PROGRAM
WELL NETWORK
UPPER ZONE
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434
SS / JB
JUNE 2014
FIGURE: 7
FILE: M:\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 7 - LONG TERM PERFORMANCE - UPPER ZONE - APRIL 2014.DWG 08/26/14 08:11:02AM, mdraft, LAYOUT: SITE PLAN

LEGEND

HYDROLOGIC ZONE (COLOR)

- SHALLOW WELL
- INTERMEDIATE WELL
- DEEP WELL

WELL TYPE (SYMBOL)

- PERFORMANCE MONITORING WELL
- MONITORING WELL
- INJECTION WELL

ROUTINE MONITORING PROGRAM SAMPLING LOCATION

SC-27S (7-22) 10.5 — WELL IDENTIFIER (COLOR/SYMBOL); WELL ID; SCREENED INTERVAL (ft. bgs); PARAMETER VALUE/RESULT

- G — GAS LINE
- S — STORM WATER LINE
- DISCHARGE LINE
- GROUND WATER RECOVERY LINE
- TAX LINE BOUNDARY (BLOCK_LOT)
- STREAM/POND
- DIRT ROAD OUTLINE
- RAILROAD
- X — FENCE
- WATER

Cr = CHROMIUM (ug/l)
Cr(VI) = HEXAVALENT CHROMIUM (ug/l)
TCE = TRICHLOROETHENE (ug/l)
NS = NOT SAMPLED
ND = NOT DETECTED
NA = NOT ANALYZED
NI = NOT INSTALLED DURING THE CORRESPONDING SAMPLING EVENT
* = ADDITIONAL SAMPLE DEPTH AT 110 FEET BELOW GROUND SURFACE

NOTES:

1. BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA.
2. LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
3. ISOPLETH CONTOURS BASED ON SAMPLES COLLECTED IN APRIL 2014.
4. SEE TABLE 3 FOR PARAMETERS TO BE SAMPLED AT INDIVIDUAL WELL LOCATIONS.

CONCENTRATION KEY

Number	MINIMUM CONCENTRATION (ug/l))	COLOR
1	100-1250	
2	>1250	

TRC ENVIRONMENTAL CORP.
1601 Market St, Suite 2555
Philadelphia, PA 19103

OU1 ROUTINE MONITORING PROGRAM
WELL NETWORK
LOWER ZONE
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY
JOB NO.: 112434

SS / JB	JUNE 2014	FIGURE: 8

FILE: M:\CAD FILES\WORK\2710ES\2014_08 LONG-TERM GW MONITORING PLAN\FIGURE 8 - LONG TERM PERFORMANCE - LOWER ZONE - APRIL 2014.DWG 08/26/14 08:09:53AM, mdraft, LAYOUT:SITE PLAN